

Memorandum

Date: August 14, 2002

Lighting the Signs on the Way to California's Bright Future

This letter describes the reasons why the California legislature should consider the formation of energy efficiency standards for externally illuminated signs in our state. Since California has taken a leadership role in identifying and exploiting energy conservation opportunities, it is clear that standards for illuminated signs arise as the sensible and beneficial next steps. Furthermore, these opportunities require regulation because the electric utilities bear a large portion of the costs of the currently inefficient system. Thus, since these costs are invisible to many consumers of electric power, market forces alone will not cause beneficial change.

The Current System of Sign Lighting

Illuminated signs of many types are used by retail establishments, businesses, and the government in order to communicate with their customers and the public. They form an integral part of our urban and sub-urban landscape and also consume a significant portion of California's available energy resources. Typical practice is to use conventional lighting systems that have low efficiency. For example, although T12 High-Output Fluorescent lamps emit 70 lumens of white light per watt of input power, as little as 10 lumens per watt may be usable once all losses inside the sign housing and lens are accounted for. Since gas-discharge lighting like neon and argon lamps are tuned to a specific color, they perform better, perhaps emitting 14 lumens per watt. But nonetheless, these sources also emit in all directions and thus suffer losses inside the sign housing. Due to technology limitations, there is little possibility of improvement to the efficiency of conventional light sources for signs.

In addition to low efficiency, low power factor is also a characteristic of conventional sign lighting systems that unduly burdens the utility system. For example, if a gas-discharge sign with a transformer has a power factor of 60% and consumes 60 watts, it places a load of 100 volt-amperes on the utility system. Consequently, the electric utility bears a great portion of the burden of these inefficiencies instead of the consumer since the consumer only meters the watts consumed. It is very much to the benefit of resource utilization that sign lighting sources have a high power factor.

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Opportunities to improve lighting systems for signs

There are three ways to improve the efficiencies of sign lighting systems in California. The first is to use light sources where the color of the source can be matched exactly to the color of the lens, resulting in the greatest utilization of light produced by the source. The second approach is to use light sources that have high luminous efficacy measured in lumens per watt in addition to uniformly directed light to minimize absorption losses inside the sign. The third important parameter is to improve the efficiency and power factor of power supplies and transformers. Technology exists today to make these improvements and has the potential to unburden more than 250 megawatts from California's utility load. Light Emitting Diodes (LEDs) accomplish all three objectives in that they employ tuned color emission, high and directed luminous efficacy, and efficient power factor electronics. LEDs are manufactured in an array of colors like bright red, blue and white and thus they perform any sign design required. Moreover, today's best red LEDs, which can be used in almost 60% of all signs made, emit up to 35 lumens per watt of pure red light. Furthermore, LED transformers with power factor in excess of 90% are well established. Most importantly, LEDs are not new to California. It is estimated that installation of LED Traffic Signals on California's roadways has resulted in direct electricity savings to the state government of \$15 million per year for the 20% of signals currently retrofitted. Thus the potential electricity savings from use of LED signs has already been proven in our community.

Recommended Evaluation Methods

California must evaluate sign illumination systems based on the criteria that provide the most benefit to electricity resource utilization. At the same time, illuminated signs provide an important communication medium in our commercial society. Thus we endorse evaluation criteria that retain expressive freedom for businesses and other employers of sign media. First, input power measurement should be the Volt-amp loads that neon transformers and LED power supplies place on the utility system, relative to their real power loads in Watts. The higher the power factor, the ratio of power in Watts to Volt-amp load, the better. Second, we suggest standards for channel letter sign efficiency of five Watts or less consumed per linear-centerline foot of sign face. This approach sets easily met standards on sign system efficiency while preserving design flexibility.

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Summary

Opportunity exists today to make significant impact on California's use of electric power in signs. Today's LED technology is more than three times more efficient than conventional light sources in the prominent colors used in signs. This advantage, fully implemented, presents the potential to reduce California's electric load by 5% of the output of an entire power plant. Since California has already taken the initiative with LED technology with excellent results in traffic signals, now is the time to put energy efficiency standards in place that mandate the use of innovative lighting technology in signs.

Prepared by:

Mr. Julian A. Carey
Market Development Manager
Lumileds Lighting, LLC